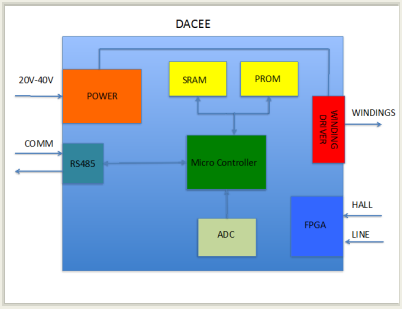
Dual Axis Controller for Extreme Environments, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

NASA's Exploration road map contains an expanded portfolio of destinations including asteroids, comets, Phobos and Deimos, Titan, Ganymede, Mars and the Moon. The environmental volatility of these locations is extreme, yet the fiscal challenges to explore these remote celestial landmarks suggests that traditional support systems and spacecraft architecture are not available and only through the development of more environmentally robust and survivable subsystems can these exploration goals be achieved. Large temperature swings are commonplace in these environments and seeing extreme cold environments of -180 degrees C or beyond can be expected at the surface of asteroids, comets, the moon, and Titan. While the objective is to gather science, NASA's spacecraft and probes need to have lightweight, compact, smart, radiation tolerant, motion control power electronics that enable scientific discovery and maximize the data returned during what are often very small windows of opportunity. The Dual Axis Controller for Extreme Environments (DACEE) addresses these challenges for future remote space exploration. Leveraging almost a decade in the area of architecting low temperature operating electronics and mechanisms for programs like MUSES-CN and MSL's cold actuator electronics technology development program, Greg Levanas will design a dual brushless/stepper, 30V, 3A motor drive system inclusive of a RS-485 communication channel and capable of delivering moderate health status including onboard voltages, current and temperature. By leveraging primarily 3.3V/5V CMOS 100krad tolerant elements, the DACEE will fit a compact form factor of approximately 2"x3"x0.5". This system will be able to start up from cold soak at -180 degrees C and survive operation thru +100 degrees C. The Phase I activity will conclude with a design, parts list, build documentation and analysis for an article ready to be produced and tested as part of a Phase II activity.



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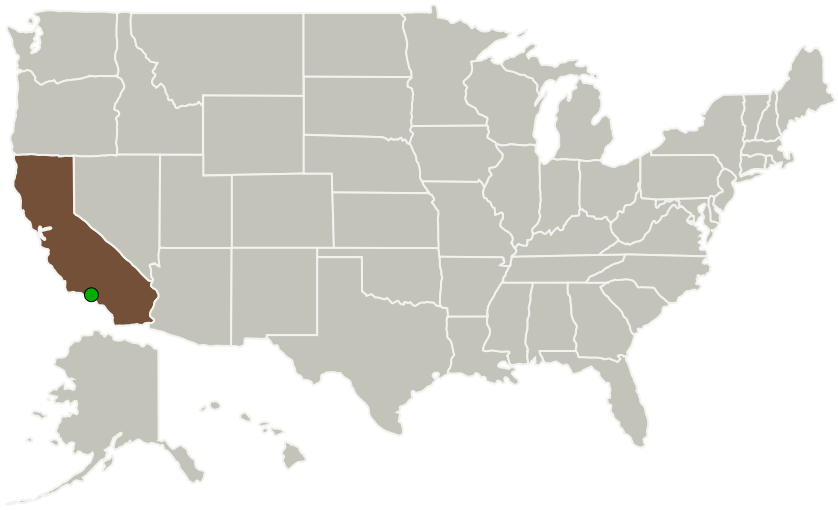
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Motiv Space Systems, Inc.	Lead Organization	Industry	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Dual Axis Controller for Extreme Environments, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138816)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Motiv Space Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

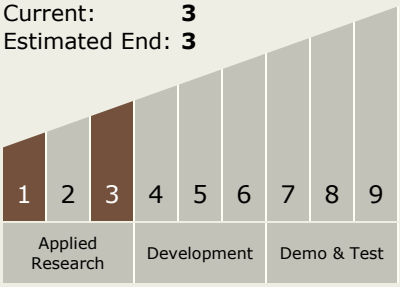
Carlos Torrez

Principal Investigator:

Greg Levanas

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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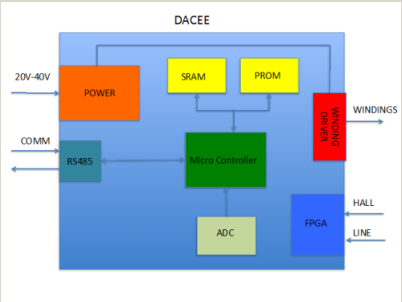
Images



Briefing Chart Image
Dual Axis Controller for Extreme Environments, Phase I
(https://techport.nasa.gov/image/126919)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.1 Management and Control

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System